Benjamin Pierce

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RESEARCH INTERESTS

Computer Vision **Machine Learning** **Data Science** **Distributed Computing**

EDUCATION

Case Western Reserve University

Aug 2017 – Expected May 2021
B.S. Computer Science
Cleveland, OH

- GPA: 3.6
- Coursework: Algorithms, Databases, Data Structures, Intro. Artificial Intelligence, Software Engineering
- Minor in Applied Data Science

EXPERIENCE

Solar Durability and Lifetime Extension Center

Aug 2018 – Present
Research Assistant
Cleveland, OH

Video/Image Processing on Crystal formation on Ni-Al alloys

- Faculty: Roger French, Jennifer Carter, Masayoshi Adachi, Hiroyuki Fukuyama
  - Collaborated on a joint project with researchers from Tohoku University, Japan
- Objective: Analyze video of rotating, molten droplet of NiAl with the aim of determining a rate of crystallization
- Analyzed over 100,000 images across 4 samples at varying temperature and composition
- Found area of surface of droplet using Canny edge detection and density-based clustering
- Accounted for rotation of droplet and backside crystallization through sliding-window estimation
- Confirmed theoretical Avrami crystallization behavior with data-driven model

Feature Extraction and Unsupervised Learning on Electroluminescence Images

- Faculty: Roger French, Jennifer Braid
- Objective: Use unsupervised learning to classify types of degradation of solar modules through electroluminescence images in a dataset of 11,000 images
- Experiments: Took electroluminescence measurements on mini-modules and adjusted data processing step to enable further analysis
- Extracted local features (blots of corrosion, darkening) using algorithms such as SIFT and KAZE
- Found module-level features with Haralick/GLCM features and specialized extraction methods
- Modeled local features using bag-of-words model, and applied hierarchical clustering to identify classes

PUBLICATIONS

- Karimi, Ahmad Maroof, Justin S Fada, Nicholas A Parrilla, **Benjamin Pierce**, Mehmet Koyutürk, Roger H French, and Jennifer L Braid. "Generalized and Mechanistic PV Module Performance Prediction from Computer Vision and Machine Learning on Electroluminescence Images." *IEEE Journal of Photovoltaics*, 9. *Submitted*

- **Pierce, Benjamin**, Ahmad Maroof Karimi, Justin Fada, Nicholas Parrilla, J. L. Braid, Mehmet Koyuturk, and Roger French. 2019. "Feature Extraction/Machine Learning for Degradation Classification of Solar Modules." Poster, CWRU SOURCE Intersections, August 2.
- **Pierce, Benjamin**, Ahmad Karimi, Laura Wilson, Andrew Loach, Sonoko Hamaya, Justin Fada, Masayosi Adachi, Hiroyuki Fukuyama, Roger H. French, and J.L.W. Carter. 2019. "Image Processing on Crystallization Growth of Rotating and Levitated Alloys." Poster, 2019 CWRU/Tohoku Symposium on Data Science in Life Sciences and Engineering, August 5.

PROJECTS

- Web-scraping online sports databases to track and predict player growth from the NCAA to the NBA
- Web marketplace with Flask frontend using MySQL backend
- Peer-to-peer local area network IDE for Python
- Raspberry Pi based handheld license plate identification device

AWARDS

SURES Scholar — CWRU SOURCE
Awarded grant funding for summer research — May 2019

Choose Ohio First Awardee- Data Science Cohort — State of Ohio
Recognized for STEM skills and awarded scholarship for education in data science — Aug 2017-

Dean's High Honors — CWRU
Made Dean's list for academic success — Aug 2017-

TECHNOLOGIES

Programming Languages	Python, R, Java, C, bash
Libraries	NumPy, sklearn, scipy, openCV, pandas
Databases	Hadoop2/Hbase, MySQL
Other	High-performance computing, LaTeX, Jira, Kanban, Git, vim

ACTIVITIES

Association for Computing Machinery	Member, 2019
CWRU Hacker Society	Member, 2017-Current
Study Abroad	Cape Town, South Africa, Summer 2018